

REMARKS/ARGUMENTS

I. Status of the Claims

Claim 3 is amended. No new matter is introduced. Support for the amendments may be found, for example, with reference to Applicant's specification at p. 16, paragraphs 82 and 83. Support for new claim 17 can be found at, for example, page 19, paragraph 102. Support for new claim 18 can be found at, for example, the Abstract. No new matter is introduced by way of amendment or addition. Claims 1-18 are presently pending.

II. Status of the Specification

The title has been amended to better describe the nature of the invention.

III. Terminology

For clarification through the Reply, the Applicants will refer to the impact strength of more than 5 kJ/m² as limitation (1), the deflection temperature as limitation (2), and the flame retardant rating as limitation (3).

IV. Claims Rejections under 35 U.S.C. § 112

Claims 1, 4-6, and 8 are rejected under 35 U.S.C. § 112, first paragraph, for lack of enablement. According to the Examiner, claims 1, 4-6, and 8 are rejected because the application does not reasonably provide enablement for components (a) and (b) with the physical limitation given in claim 1. Specifically, the Examiner states that Applicants fail to teach a method for making a metal hydroxide in a lactic acid resin having a sufficient flame, heat, and impact resistance as claimed in claim 1 without the addition of component (c) or components (d) and (e). Applicants respectfully traverse.

As set forth below, one of ordinary skill in the art could practice the invention without undue experimentation.

To be enabling, the specification must teach one of ordinary skill in the art to make and use the full scope of the claimed invention without "undue experimentation."

In re Wright, 999 F.2d 1557, 1561, 27 U.S.P.Q.2d 1510, 1513 (Fed. Cir. 1993). As long as “undue experimentation” is not involved, a specification complies with the enablement requirement, even if a reasonable amount of routine experimentation is required to practice the invention. *Enzo Biochem Inc. v. Calgene*, 188 F.3d 1362, 1371, 52 U.S.P.Q.2d 1129, 1135 (Fed. Cir. 1999). Even “a considerable amount of experimentation is permissible, if it is merely routine.” *In re Wands*, 858 F.2d 731, 737, 8 U.S.P.Q.2d 1400, 1404 (Fed. Cir. 1988).

It is the Examiner’s burden to provide a reasonable explanation of why the specification does not enable the scope of the pending claims. *In re Wright*, 999 F.2d 1557, 1561-1562, 27 U.S.P.Q.2d 510, 1513 (Fed. Cir. 1993).

The following analysis of the claimed invention using the factors regarding enablement set forth in *In re Wands* illustrates that it would not require undue experimentation to practice the claimed invention.

The nature of the invention. The nature of the invention is a flame retardant injection molded object formed from a resin composition that includes a lactic acid based resin (a) and a metal hydroxide treated with a silane coupling agent (b) with specified physical limitations (1), (2), and (3).

The state of the prior art. The state of the prior art is advanced. Injection molded plastic has been studied for many years and injection molding does not represent a new or unpredictable area of science. Metal hydroxides used as flame retardants that are environmentally friendly have also been studied. Specification, p. 2, paragraph 7.

The relative skill in the art. The level of skill in the art is high. A person of ordinary skill in the art, for example, would know and how to make an injection molded object out of a single lactic resin. Knowledge of how to include a metal hydroxide in the injection molded object would be understood based on the specification at p. 12, paragraph 62.

The predictability or unpredictability of the art. The nature of the invention is an injection molded object formed from a resin composition that includes a lactic acid based resin and a metal hydroxide treated with a silane coupling agent. No previous biodegradable resin inventions have included all three limitations of flame retardance,

impact resistance, and heat resistance. However, biodegradable resins that include lactic acid based resin in combination with other polyesters have been studied within the field. Specification, p. 1-2, paragraphs 3-4. Metal hydroxides have also been used for their flame retardant properties in other research. Specification, p. 2, paragraph 3. Other lactic acid based resin inventions have impact resistance (1) and heat resistance (2). Specification, p. 3, paragraphs 12 and 13.

The amount of direction or guidance presented. The Examiner states that the specification fails to teach a method for making a metal hydroxide in a lactic acid resin with limitations (1), (2) and (3) in claim 1 without the addition of components (c), (d) or (e).

Routine research, even if extended, is permissible as long as the specification provides sufficient direction or guidance to the skilled artisan. MPEP § 2164.06. Nothing more than objective enablement is required and therefore it is irrelevant whether a teaching is provided through broad terminology or illustrative examples. *In re Wright*, 999 F.2d 1557 (Fed. Cir. 1993).

The parameters in the specification provide adequate guidance for those skilled in the art to conduct reasonable, but not undue, experimentation, and to readily utilize compounds in the claimed methods. The manufacturing method for the first embodiment can include, but does not require, component (c), just as the first embodiment does not require other additives. Therefore the manufacturing method in the specification can be used to produce the (a) and (b) resin. The method is reproduced on page 4, paragraphs 61-75. The parameters for a resin compounds with limitations (1), (2), and (3) are clearly stated on p. 2, paragraph 15-16 of the specification. Therefore, the claims are adequately enabled by the specification.

The quantity of experimentation needed. Applicants disclosed the basis of the invention, information about the resin compound, and methods to make it, making the quantity of experimentation low. Applicants submit that the disclosure of this invention is more than general ideas that may or may not be workable. In contrast, the Examiner has failed to raise and substantiate a reasonable doubt of the objective truth of the statements

contained in the disclosure. Therefore, the Examiner has not met the burden required to raise a proper enablement rejection. MPEP § 2164.04.

In view of the foregoing, claims 1, 4-6, and 8 would not require undue experimentation and the Examiner has not yet established a prima facie case of non-enablement. Applicants respectfully request that this rejection be withdrawn.

Claims 3 and 13-16 are rejected under 35 U.S.C. § 112, second paragraph for failing to define the metes and bounds of the claim in regards to the term "aromatic aliphatic." The Examiner states that the term "aromatic aliphatic" is indefinite because the specification does not clearly define the term. Applicants respectfully traverses the rejection on the grounds that the term is used according to its ordinary meaning as understood by one of ordinary skill in the field of synthetic biodegradable polymers. Twarowska-Schmidt and Maria Ratajska use the term in their paper, stating that "aromatic-aliphatic polyester containing structural units of typical terephthalic polyesters, aliphatic polyesters like poly(ethylene adipate) and other polyesters based on dicarboxylic acids are a member of the synthetic biodegradable polymers". Krystyna Twarowska-Schmidt and Maria Ratajska, *Biodegradability of Non-Wovens Made of Aliphatic-Aromatic Polyester*, Institute of Chemical Fibres, January/March 2005, Vol 13. No. 1 (49), http://www.fibtex.lodz.pl/49_21_71.pdf. Ilona Kleeberg, et. al. also use the term in their research to describe a copolymer using terephthalic acid, adipic acid and 1,4-butanediol as an aromatic-aliphatic polyester. *Biodegradation of Aliphatic-Aromatic Copolyesters by Thermomonospora fusca and Other Thermophilic Compost Isolates*, Appl Environ Microbiol. 1998 May 64(5): 1731-1735, <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=106223>). This combination of polymers is recommended in the current specification at p. 19, paragraph 98. Thus it is well understood in the art that "aromatic-aliphatic polyester" include biodegradable aromatic-aliphatic polyesters consisting of one or more aromatic and aliphatic polyester. Accordingly, the term is used to its ordinarily accepted meaning. Thus the term is not "an oxymoron." In short, one of ordinary skill in the art would readily understand the metes and bounds of the term. The present rejection should be withdrawn. Even though the Applicants respectfully disagree with the Examiner's arguments, the Applicants have

amended all claims referencing “aromatic aliphatic polyester” to “aromatic-aliphatic polyester” as that is the most common spelling for the term within the field.

V. Claims Rejections under 35 U.S.C. § 102

Claims 1, 4, and 6 are rejected as allegedly anticipated by JP 2002-105298A (“Shimatzu”). According to the Examiner, Shimatzu discloses a lactic acid resin and a metal hydroxide treated with a silane coupling agent, present at 1%-30% by mass of the formulation, with an impact strength of more than 5 kJ/m². The Examiner’s position is that the physical properties recited in claim 1 are inherent to Shimatzu’s composition. Applicants respectfully traverse the above rejection. Limitations (2) and (3) will not be inherently met because, while the physical properties between the Applicants’ system and Shimatzu’s system are similar, they are not the same.

Anticipation requires that each claim limitation be set out explicitly or inherently in a single reference. *Atofina v. Great Lakes Chem. Corp.*, 441 F.3d 991, 999 (Fed. Cir. 2006). Inherency requires that the “missing descriptive matter is necessarily present in the thing described in the reference.” MPEP § 2131.01(III), *quoting Continental Can Co., v. Monsanto Co.*, 948 F.2d 1264, 1268 (Fed. Cir. 1991).

Here, the specification shows that impact strength is not directly related to either a deflection temperature or a flame retardant rating. Comparative Example 2, Specification, p. 30, second full paragraph, discloses a composition wherein the flame retardant level is V-2 and the heat resistance is 60°C, but the impact resistance is only 1 kJ/m². Thus, there is not a complete correlation between the flame retardant level and the heat resistance. A material having a particular impact strength will not necessarily have a corresponding deflection temperature or flame retardant rating and vice versa. It is clear that the resin composition disclosed in Shimatzu will not necessarily have limitations (2) and (3) within the claimed parameters. Thus, Shimatzu’s material does not inherently have the claimed limitations and Shimatzu does not anticipate, explicitly or inherently, Applicants’ claims 1, 4, and 6.

Furthermore, Shimatzu’s resin composition contains at least one additional bulking agent ingredient. Shimatzu states that the bulking agents “improve strength” and the addition of more than 30% of the weight will result in a decrease in dispersibility,

such that “it will become easy to generate a crack.” (Shimatzu, paragraph 12.) Specifically, the experimental results in Shimatzu’s Table 1 disclosing the impact resistance of 5 kJ/m^2 relate to a resin composition contains three different bulking agents. (Shimatzu, paragraph 25). Based on this, it is clear that the inclusion of the bulking agents have an effect on the strength and impact resistance of Shimatzu’s composition and therefore, the results achieved with the Applicants’ composition is not comparable and not anticipated, explicitly or inherently, by Shimatzu.

VI. Claims Rejections under 35 U.S.C. § 103

A. Rejections of Claims 2, 3, 7, 9, 12, 13, and 16 under 35 U.S.C. § 103

Claims 2, 3, 7, 9, 12, 13, and 16 are rejected under 35 U.S.C. § 103(a) as being obvious over Shimatzu in view of the Examiner’s statement of ordinary skill in the art. Specifically, the Examiner contends that Shimatzu discloses a polyester prepared by a diol/dicarboxylic acid polymerization. The Examiner states that based on the fact that Shimatzu’s base resin is a polylactic acid, it would have allegedly been obvious at the time of invention to copolymerize lactic acid into Shimatzu’s additive because copolymers help break up crystallinity and ultimately cause the formulation to become more impact resistive.

Applicants respectfully traverse the rejections. Statements in Shimatzu teach away from a resin composition that does not contain at least one bulking agent. Shimatzu makes it clear that the invention should have preferably five bulking agents and at the very least one bulking agent. The reasoning behind this is that the bulking agents improve the strength of the composition. The composition used in Shimatzu’s Examples uses three bulking agents and consistently achieves an impact resistance reading of greater than 5 kJ/m^2 . Shimatzu makes it clear in both his specification and claims that the bulking agents are an important part of its composition and affects the results of the impact resistance. For these reasons, it would be incompatible to remove bulking agents from a resin composition that is attempting to achieve an impact resistance reading of greater than 5 kJ/m^2 .

Furthermore, Applicants’ invention uses no bulking agents in its composition and yet still achieves impact resistance levels that are consistently and surprisingly higher

than Shimatzu's. The following chart shows a comparison of the listed impact resistance values for both Shimatzu and Applicants' invention in claims 2 and 3.

Comparison of Impact Resistance Results
for Compounds with Compositions from Claim 2 and 3

Shimatzu (with bulking agent) in kJ/m ²	Applicant (without bulking agent)	
	in kJ/m ²	Composition
5.1	18	Claim 3
5.8	11	Claim 2
7.3	23	Claim 2
9.3	16	Claim 3
	30	Claim 3

As can be seen, the claimed invention, without a bulking agent, achieves a higher impact resistance than the Shimatzu's composition. Shimatzu teaches towards using bulking agents in the resin composition, thus one of ordinary skill in the art is taught to utilize bulking agents, and not to create the Applicants' resin composition, to increase the impact resistance of the invention. For at least these reasons, claims 2 and 3 are not obvious in view of Shimatzu and stand in condition for allowance. As claims 7, 9, 12, 13, and 16 depend directly or indirectly from allowable claims 2 or 3, Applicants further submit that all dependent claims are also allowable for at least this reason. Thus these claims are also not obvious over Shimatzu. Reconsideration of the claims and withdrawal of the rejections based on Shimatzu are requested. Applicants therefore respectfully request that the rejection of the claims under 35 U.S.C. §103 be withdrawn.

B. Rejections of Claims 3, 7, 13, and 16 under 35 U.S.C. § 103

Claims 3, 7, 13, and 16 are rejected under 35 U.S.C. § 103(a) as being obvious over Shimatzu in view of the Examiner's statement of ordinary skill in the art. The Examiner states that Shimatzu discloses polybutylene succinate, a plasticizer by 5-25% mass, which matches up with the Applicants' disclosed range of 0.1% to 5% by mass. The Examiner states that due to the known plasticizing effect of esters established in Shimatzu, it would have been obvious at the time of the Applicants' invention that lowering the amount of the ester in the composition would decrease the effect of the ester as a plasticizer.

Applicants respectfully traverse the Examiner's contentions. Independent claim 1 is not obvious and dependent claims 3, 7, 13, and 16 are also not obvious because of the reasons stated above. For at least these reasons, Applicants respectfully submit that claim 3 is not obvious in view of Shimatzu and stands in condition for allowance. As claims 7, 13, and 16 depend directly or indirectly from allowable claim 3, Applicants further submit that all claims are also allowable for at least this reason. Applicants therefore respectfully request that the rejection of the claims under 35 U.S.C. §103 be withdrawn.

C. Rejections of Claims 5 and 8 under 35 U.S.C. § 103

Claims 5 and 8 are rejected under 35 U.S.C. § 103(a) as being obvious over Shimatzu in view of Yagawa et al. (US 5,340,867). As already discussed, the Applicants' invention is not anticipated or obvious over Shimatzu. Even if the Examiner does find correspondence with Shimatzu, the Applicants' invention is not obvious in view of Yagawa. The Examiner states that it would be reasonable to modify Shimatzu's aluminum hydroxide particle by substituting Yagawa's aluminum hydroxide particle size as they are being used in a similar capacity.

Yagawa states that a preferred particle size for aluminum hydroxide is no more than 1.0 μm . Yagawa discloses that the smaller particle size develops the flame retardant effect "with the synergistic action of red phosphorus and nitrile group-containing elastomer." The disclosed particle size is to be used in conjunction with the red phosphorus and nitrile group-containing elastomer in the Yagawa invention in order to achieve the desired effect.

Applicants respectfully traverse the argument. Yagawa is not using the aluminum hydroxide in the same manner as in Shimatzu or Applicants' invention. The particle size in Applicants' invention is chosen to keep the decrease in the impact resistance to a minimum while maintaining the flame retardation level at a plannable stage. However, the particle size of the aluminum hydroxide in Applicants' invention is not linked to any other components, like it is in Yagawa, nor is it required to react with other components to achieve a certain desired property, like it is in Yagawa. The strongest rationale to combine references is that some advantage or expected beneficial result would have been produced by their condition. MPEP § 2143.03. One ordinarily skilled in the art would not

have tried to combined the particle size in Yagawa to achieve a flame retardant effect without also considering the addition of the red phosphorus and nitrile group-containing elastomer that are necessary to create the effect. Based on this, Yagawa teaches away from using a small particle size without using red phosphorus and a nitrile group-containing elastomer. The Examiner cannot pick one aspect of a reference's invention to combine in an obviousness argument, when that aspect is clearly utilized in conjunction with other components.

For at least these reasons, Applicants respectfully submit that dependent claims 5 and 8 are not obvious in view of Shimatzu and stand in condition for allowance. Applicants therefore respectfully request that the rejection of the claims under 35 U.S.C. §103 be withdrawn.

D. Rejections of Claims 10 and 11 under 35 U.S.C. § 103

Claims 10 and 11 are rejected under 35 U.S.C. § 103(a) as being obvious over Shimatzu in view of Yagawa. based on the preferred disclosed particle size for aluminum hydroxide of no more than 1.0 μm in Yagawa. As already discussed, the Applicants' invention is not obvious over Shimatzu. Further, Applicants' invention is not obvious in view of Yagawa for the same reasons as discussed above.

E. Rejections of Claims 13 and 14 under 35 U.S.C. § 103

Claims 13 and 14 are rejected under 35 U.S.C. § 103(a) as being obvious over Shimatzu in view of Yagawa based on the preferred disclosed particle size in Yagawa for aluminum hydroxide of no more than 1.0 μm . As already discussed, the Applicants' invention is not obvious over Shimatzu. Further, Applicants' invention is not obvious in view of Yagawa for the same reasons as discussed above.

Applicants respectfully request the present rejections be withdrawn.

VII. New Claims 17 and 18

New claim 17 states a range of 0.1-3% based on the results from Table 4 and 5 in the specification at pages 33 - 34. These results show that the best results for impact strength occur at 3% (see Example 11 and Example 13 in Tables 4 and 4 respectively).

This range does not overlap the values stated in Shimatzu. For these reasons, we believe the claim is in condition for allowance.

Applicant believes new claim 18 is allowable because, inter alia, the language “consisting essentially of” excludes bulking agents taught by Shimatzu.

CONCLUSION

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

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Respectfully submitted,

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